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average height, with shorter heads and fewer grains, thus emphasizing the importance of selecting the superior plants instead of the superior individual grains. As this variety of oats was undoubtedly a mixture of several distinct biotypes, it does not follow that the same mathematical results would be found in other varieties composed of different mixtures. The variety with which WALDRON worked may have contained a short-headed, short-culmed, heavy-grained biotype. In some other mixture the heavy-grained biotype might have longer culms, longer heads, and more numerous grains, and it would then give a positive correlation where WALDRON found a negative correlation, but this does not lessen the importance of the conclusion reached that the individual plant and not the individual grain is the proper unit of selection.—GEO. H. SHULL.

Anatomy of the seedling of *Trapa*.—A short paper by QUEVA¹¹ on the curious seedling of *Trapa natans* recalls the case of “caulicle” vs. “radicle,” the question of the importance of the root as a primarily essential part of a seed plant. The author confirms the observations of previous investigators concerning the marked inequality of the cotyledons, the negative geotropism of the caulicle (which he prefers to call the hypocotyledonary axis), and the presence of internal phloem in the stem and leaves. His own investigation has resulted in the discovery of this internal phloem in the hypocotyledonary axis and in the petiole of the cotyledon. Although he finds in the very tip of the hypocotyledonary axis a vascular condition which is peculiarly root-like (two xylem points alternating with two small groups of phloem), yet he thinks it is not root, because (1) there is no rotation of the strands in successive levels from the tip of the organ to the cotyledonary node; (2) the xylem points are too near the periphery of the cylinder to look like root poles; and (3) the whole organ is covered by epidermis, except at the spot where the suspensor was attached. The growth of the caulicle, or hypocotyledonary axis, is limited; the roots strike out from its side, their vascular strands being inserted on certain metaxylem elements discernible in cross-section on one side of the vascular cylinder.—SISTER HELEN ANGELA.

Sporophylls of *Selaginella*.—SYKES and STILES¹² have made a very interesting study of the sporophylls of *Selaginella*, finding an amount of variation and a degree of complexity that have not attracted attention heretofore. A few of the more representative species are described and the different forms of the sporophyll are pointed out as “special adaptations for the secure protection of the sporangia.” In many sporophylls there is a well developed air cavity in the base, and the authors suggest “that they recall the mucilage

¹¹ QUEVA, C., Observations anatomiques sur le *Trapa natans* L. Compt. Rend. Assoc. Fran. Av. Sci. 1909. Congrès de Lille, pp. 512-517. figs. 2. 1909.

¹² SYKES, M. G., and STILES, W., The cone of the genus *Selaginella*. Annals of Botany 24:523-536. pl. 41. 1910.

cavities of *Lycopodium* and the parichnos of fossil genera." In some cases the sporophylls are provided with more or less conspicuous dorsal outgrowths, which have been noted heretofore only in a casual way, but not definitely described. Four types of sporophyll are described: (1) with well developed dorsal flap extending freely downward and protecting the young sporangium immediately below it (as *S. rupestris*); (2) with no dorsal flap, the sporophyll being flat and the sporangium exposed (as *S. spinosa*); (3) with a well developed dorsal projection which is not free but decurrent (as *S. helvetica*); and (4) a series in which the dorsal outgrowth is gradually reduced and lost, each sporophyll more and more completely infolding the sporangium below (as *S. flabel-lata* to *S. apus*).—J. M. C.

Morphology of *Callitris*.—SAXTON,¹³ in continuing his studies of gymnosperms, has given an account of *Callitris*, an Australasian genus of about a dozen species. The one chiefly studied was *C. verrucosa*, but the results doubtless apply to the genus as a whole, since the species are very closely allied. The sporophylls are in alternating whorls of three, each microsporophyll bearing three sporangia, and each of the upper megasporophylls bearing about 15 ovules, the six sporophylls of the ovulate strobilus producing about 60 ovules. The cells of the mature female gametophyte are all binucleate or multinucleate. The archegonia occur in a single group of about 20, never at the apex of the gametophyte, but along the inner side of the pollen tube near its apex. If two pollen tubes are present, two such groups are organized. The proembryo completely fills the archegonium, the arrangement of cells being variable. More than one embryo is formed from a proembryo, and the first two walls are longitudinal, the mature embryo being dicotyledonous. The claim is well substantiated that *Callitris* and *Widdringtonia* are two distinct genera, but that they should constitute a separate tribe (Callitrineae) coordinate with Cupressineae is not so clear.—J. M. C.

Structure of *Mitrospermum*.—Mrs. ARBER¹⁴ has investigated the structure of the platyspermous seed described by WILLIAMSON in 1877 as *Cardiocarpon compressum*, and occurring in the British Lower Coal-measures. The outer fleshy (forming the wing-like extension), stony, and inner fleshy layers are recognized and described. Two opposite vascular strands arise from the expanded bundle beneath the nucellus and traverse the outer fleshy layer in the principal plane of the seed, probably continuing almost the whole length of the seed. The nucellus seems to have been entirely free from the integument, and in one seed a tissue within the embryo sac was observed, consisting of "irregular roundish cells," which of course represent the female gametophyte. The

¹³ SAXTON, W. T., Contributions to the life history of *Callitris*. Annals of Botany 24:557-569. pls. 45, 46. 1910.

¹⁴ ARBER, AGNES, On the structure of the paleozoic seed *Mitrospermum compressum* (Will.). Annals of Botany 24:491-509. pls. 37-39. figs. 2. 1910.